

Generalized interpolating polynomial operator A_n

Galimyanov A., Minnegalieva C.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© Research India Publications 2015. The article describes the construction of a linear operator which puts into correspondence an arbitrary 2π - periodic function with zero mean trigonometric polynomial. During an operator construction the decomposition in Fourier series, the Weil operator of fractional integration, Lagrange interpolation polynomial, the properties of fractional differentiation and fractional integration are used. An operator type is obtained, the corresponding formula is derived. A formula type is shown taking into account the form of the trigonometric complex numbers. The relationship of the generalized interpolation operator A_n with Fourier operator S_n is considered. The approximation of functions by the means of an obtained polynomial operator and the evaluation of error is verified using a computer algebra system Wolfram Mathematica. The approximation of function by a trigonometric polynomial obtained by the derived formulas is conducted for different functions at different values of node numbers. The calculations showed that the difference module between the values of 2π - periodic function with a zero mean value and the values of trigonometric polynomial, constructed with the help of an operator $A_n(\varphi; t)$, decrease with the order of α integration (the values $0,5 < \alpha < 1$ were considered). The value of the modulus is less if a midportion of the interval is taken, presumably it is related to the fact that the difference $\varphi - A_n\varphi$ converges on the average. The growth of node number n also make the function approximation better.

Keywords

Fractional integration, Interpolation polynomial, Linear operator, Polynomial operator, Trigonometric polynomial, Weil fractional integral